

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07/01/09 has been entered.

Response to Amendment

2. Amendment to claim 1 is acknowledged. In view of amended claim 1, the Applicant has argued that none of the cited prior art discloses the limitations "wherein the laser resonator is designed to operate with a repetition rate of greater than 50 KHz and has a pulse stretcher, inside a cavity of the resonator, as a specially designed component, the pulse stretcher having at least one of a structure- or material- related dispersive effect, the pulse stretcher having a minimum of 3rd order dispersion with a maximum 2nd order dispersion." In particular, the Applicant has argued that Hentschel discloses the SF 57 glass block as the pulse stretcher is not provided within the cavity of the laser resonator because Hentschel uses an "extra-cavity" pulse shaping setup with a long stretcher component. The Examiner has found the argument persuasive and the previous Office action has been withdrawn.

Response to Arguments

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3. Applicant's arguments with respect to claims 1-12 and 14-17 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 1-9, 11-12, 14 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perry et al (US Patent 6,150,630) in view of T.B. Norris ("Femtosecond pulse amplification at 250 kHz with a Ti:Sapphire regenerative amplifier and application to continuum generation" Optical Society of America 2412 Optics Letters 17(1992) July 15, No. 14) (Applicant Admitted Prior Art) and M. Hentschel et al (Generation of 0.1-TW optical pulses with a single-stage Ti:Sapphire amplifier at a 1-kHz repetition rate" Appl. Phys. B 70 [Suppl.], S161-S164 2000) (Applicant Admitted Prior Art).

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7. In re claim 1, with reference to figure 4, Perry et al discloses laser system according to the principle of the regenerative amplifier (56, col. 6 lines 66-67), comprising: an amplifying laser medium (Ti:Sapphire medium 58, col. 6 line 67 - col. 7 line 1), a laser resonator having at least one resonator mirror (resonator formed by cavity mirrors 68 and 70, as shown in figure 4) and at least one modulator (Pockels cell 62 & 64, col. 7 lines 1-4), and a pump source (Nd:YLF Pump Laser 71, as shown in figure 4) for pumping the laser medium, wherein the laser resonator is designed to operate with a repetition rate of greater than 50 kHz (high repetition rate ranging from 0.01 to over 100 kHz, col. 2 lines 23-26) and has a pulse stretcher (pulse stretcher 48, col. 6 lines 63-65).

8. Perry et al do not disclose the pulse stretcher inside a cavity of the resonator. However, with reference to figure 1, T. B. Norris discloses a regenerative amplifier comprising a pulse stretcher inside a cavity of the resonator (see abstract lines 1-4). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser system of Perry et al with the pulse stretcher inside a cavity of the resonator as taught by T. B. Norris in order to obtain both pulse stretching by positive GVD and application of negative TOD (see left column, last paragraph, p391).

9. Perry et al do not disclose the pulse stretcher having at least one of a structure- or material- related dispersive effect, the pulse stretcher having a minimum 3rd order dispersion with a maximum 2nd order dispersion. However, with reference to figure 3, M. Hentschel et al disclose a pulse stretcher which includes a SF57 glass (page S162,

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first paragraph under 2 Setup) having a minimum 3rd order dispersion with a maximum 2nd order dispersion (the pulse stretcher as SF57 has an inherent material property of having a minimum 3rd order dispersion with a maximum 2nd order dispersion). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser system of T.B. Norris with a pulse stretcher having a material property of a minimum of 3rd order dispersion with a maximum of 2nd order dispersion as taught by M. Hentschel et al in order to obtain high efficiency pulse stretching without introducing any alignment issue (page S162, first paragraph under 2 Setup).

10. In re claim 2, M. Hentschel et al disclose wherein the pulse stretcher has a block of highly dispersive material (inherent property of SF57).

11. In re claim 3, M. Hentschel et al disclose multiple reflections takes place within the block (inherent for SF57).

12. In re claims 4 and 16, T. B. Norris discloses wherein the pulse stretcher has a dispersive layer structure (interpreted to be CM's or concave mirrors used as a folding mirror, see figure 1).

13. In re claim 5, M. Hentschel et al disclose wherein the pulse stretcher has at least two reflecting surfaces, the surface being arranged in such a way that the surface are oriented relative to one another, at an opening angle, and the laser beam is reflected at least twice at at least one of the surface (SF 57 inherently comprises two parallel side surfaces at an angle which laser beam is reflected at least twice on each surface).

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14. In re claim 6, Perry et al / T.B. Norris / M. Hentschel et al have disclosed the claimed invention above except wherein the laser medium has an inversion life (storage time) greater than 1 ms. It would have been obvious to one having ordinary skill in the art at the time the invention was made to choose a laser medium having an inversion life of greater than 1 ms in order to obtain a higher output power, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

15. In re claim 7, Perry et al disclose wherein a femtosecond oscillator for inputting seed pulses, the femtosecond oscillator being formed and arranged in such a way that the seed pulses are femtosecond pulses or picosecond pulses on input into the laser resonator (col. 2 lines 23-26).

16. In re claim 8, T.B. Norris discloses wherein an electro-optical switching element as modulator (Q-switch) (see figure 2).

17. In re claim 9, T.B. Norris discloses wherein a pulse compressor (compressor consists of a plurality of SF10 prism) is outside the laser resonator (see figure 1).

18. In re claim 11, Perry et al disclose wherein the pump source is a laser diode (Nd:YLF Pump laser, see figure 4).

19. In re claim 12, M. Hentschel et al disclose wherein the highly dispersive material is SF57 glass block (page S162, first paragraph under 2 Setup).

20. In re claim 14, Perry et al disclose wherein the laser medium is a Yb:glass or Yb:crystal (col. 5 lines 45-53).

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21. In re claim 17, Perry et al disclose a relationship of the pulse compressor outside the laser resonator is according to Treacy design (inherent, based on the claim language, the Examiner notes that Treacy design is satisfied if the pulse compressor is placed outside of the laser resonator).

22. Claims 10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perry et al (US Patent 6,150,630), T.B. Norris ("Femtosecond pulse amplification at 250 kHz with a Ti:Sapphire regenerative amplifier and application to continuum generation" Optical Society of America 2412 Optics Letters 17(1992) July 15, No. 14) (Applicant Admitted Prior Art) and M. Hentschel et al (Generation of 0.1-TW optical pulses with a single-stage Ti:Sapphire amplifier at a 1-kHz repetition rate" Appl. Phys. B 70 [Suppl.], S161-S164 2000) (Applicant Admitted Prior Art) as applied to claim 1 above, and further in view of H. Takada et al ("Large-ratio stretch and recompression of sub-10-fs pulses utilizing dispersion managed devices and a spatial light modulator", Appl. Phys. B 74 [Suppl.], S253-S257 2002) (Applicant Admitted Prior Art).

23. In re claims 10 and 15, Perry et al / T.B. Norris / M. Hentschel et al have disclosed the claimed invention above except wherein the pulse compressor has a dispersive grating having less than 1200 lines/mm. However, with reference to figure 6, H. Takada et al disclose a dispersion compressor includes a pair of dispersive grating with 200 lines/mm for compressing pulses. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a pulse compressor

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with a pair of dispersive grating of less than 1200 lines/mm to compress pulses since it is a known alternative to a pulse compressor comprising a plurality of prism.

Allowable Subject Matter

24. Claim 13 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

25. The following is an examiner's statement of reasons for allowance: claim 13 is believed to be allowable over the cited prior art. M. Hentschel et al disclose a pulse stretcher SF 57 inherently comprises two parallel side surfaces at an angle which laser beam is reflected at least twice on each surface. However, M. Hentschel et al fail to disclose the surfaces of the SF 57 pulse stretcher are adjustable.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YUANDA ZHANG whose telephone number is (571)270-1439. The examiner can normally be reached on Monday-Friday, 9:00am-5:00pm EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Yuanda Zhang/
Examiner, Art Unit 2828
11/10/09

/Minsun Harvey/
Supervisory Patent Examiner, Art Unit 2828